CHAPTER 1

INTRODUCTION

1.0 Introduction

Fire induced collapsed of the world trade centre (WTC), New York on 9th September 2001was highlighted that the important of performance construction materials at high temperature loading especially for the high rise building.

The high strength concrete (HSC) is a materials often used in high rise building structure design. HSC can be manufactured by most concrete plane using the state of additives such as silica fume and super plasticizer or water reducing admixture. In the high rise building structure, the HSC offer significant economical and achievement advantages over ordinary concrete or normal strength concrete (NSC).

However, results of many recent fire tests have shown that there are much different this of two types of concrete HSC and NSC during the high temperature exposure. These include the different in mechanical behavior properties such as compressive strength retained by HSC and NSC at high temperature. HSC specimen show fail by explosive spalling when subjected to rapid heating.

"Malhotra (1956), Zoldners (1960), Davis (1967), Abrams (1971), Faiyadh (1989),Khoury (1992) and Noumowe et. Al (1994) has reported the effect of high temperature exposure on the properties of concrete. Several mechanism have identified for the deterioration of concrete due to high temperatures. These include decomposition of the calcium hydroxide into lime and water, expansion of lime on re-hydration, destruction of gel structure, phase transformation in some types of aggregate and development of micro cracks due to thermal incompatibility between cement paste matrix and aggregate phase"

The type of aggregate also influenced the response of concrete to high temperature. On this research, assumes that all the aggregate and other materials used follow the British Standard, ASTM or equivalent.

At the end of this research, the mechanical behavior of HSC exposure in high temperature will know and it will assist in the development of new standard for used the HSC. These data produced may be being able to assist in the development of new formulation of HSC that are less prone to explosive spalling.

1.1 Objective

Generally the main objective of this research is to study the mechanical properties of high strength concrete after heated in high temperature. In detail the objective of this research as a following:

- To find out the mechanical behavior of High Strength Concrete at temperature 200^0C to 1000^0C
- Determine the percentage of HSC strength reduction by increasing temperature loading from 200^0C to 1000^0C with rating 200^0C per hour.
- Determine a systematic comparison of result of high temperature test on Normal Strength Concrete (NSC – grade 30 MPa) and High Strength Concrete (HSC – grade 60 MPa) specimen to examine the effect of high temperature exposure to the mechanical properties of concrete with different original compressive strength.

1.2 Scope of Research

The mechanical properties of high strength concrete at high temperature influenced by type of aggregate properties, water content, admixture content and etc. in this research, the scope will covered following:

- Concrete design mix for both type of concrete is used BS 8110. The types of concrete to be used, 30MPa & 60Mpa. The entire test involved before heated in high temperature will be conduct and the result of testing will be used as a controlled data.

- Only the ***unstressed residual property test*** will be done which mean the specimens allowed to cool down within 24 hours after heated on the target temperature.

Value of the compressive strength will be recorded and analyzed for the temperature 200^0C, 400^0C, 800^0C and 1000^0C or until specimens explode which reached first

1.3 Research Methodology

The research methodology started from find the problem and then to resolved the problem. All stage to get the result as shown in the following Figure 1.

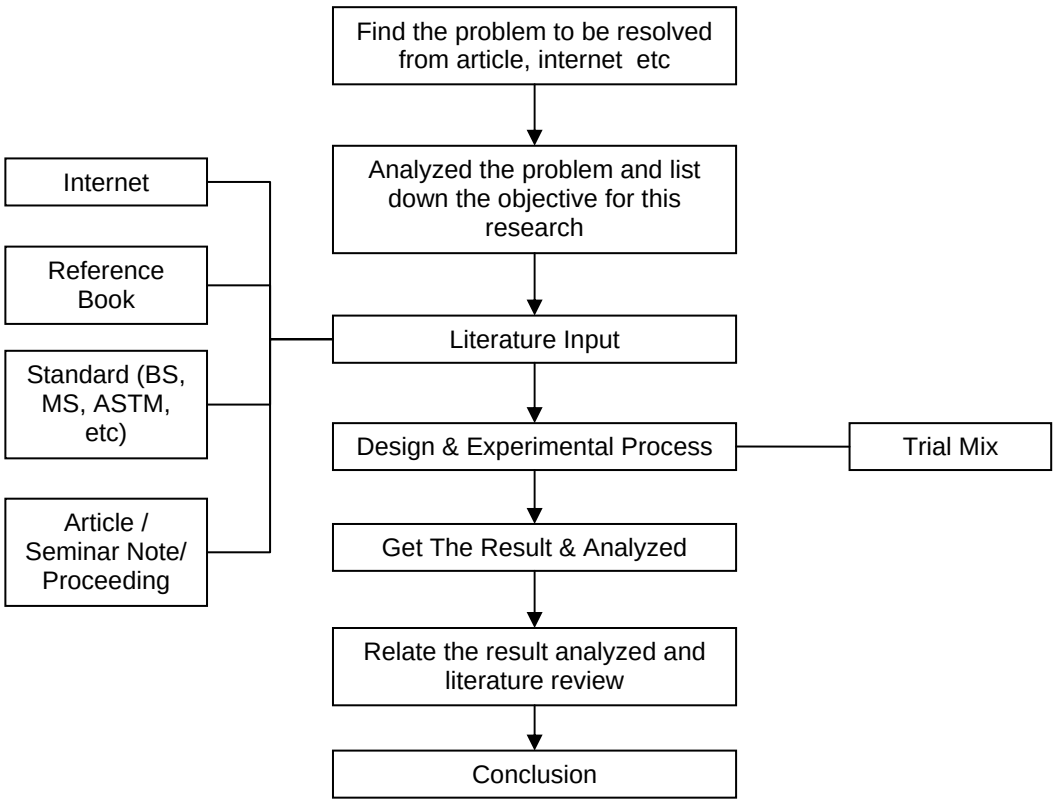

Figure 1: Research Methodology Flow Chart